ANALYSIS OF DOSE CHARACTERISTICS IRRADIATED (TH, PU) O_2 FOR THE ORGANIZATION OF ACCOUNTING AND CONTROL OF NUCLEAR MATERIALS IN THE PRODUCTION

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Because of neutron radiation and processes which lead to its education in crust, are connected difficult about the diverse nuclear and physical phenomena. The main processes causing the natural neutron radiation of the got breeds following: 1) spontaneous division of heavy-nuclei; 2) (α, n) - reactions on easy elements under the influence of natural - radiators; 3) generation of neutrons under the influence of space radiation; 4) resonant photonuclear reactions.

The contribution of the listed above channels of formation of a neutron background will be defined by composition of ore, technology of production and processing, feature of course (α, n) - reactions. If at uranium production there is a powerful source of α - particles, the significant role in formation of a neutron background is played (α, xn) - reactions. An exit of neutrons on reaction (α, n) for the most widespread elements of crust is studied rather well [1], he is studied also for the fresh and irradiated nuclear fuel [2]. Despite it the tendency of increase of a neutron background of the fresh and irradiated nuclear fuel (the regenerated fuel, fuel compositions of type – (Pu, Th) by O_2, (U, Pu) O_2, UC / (U, Pu) C, UN / is observed already today (U, Pu) N)) that demands revision of procedures of the treatment of this fuel in production.

Work purpose: to carry out a settlement assessment of an exit of neutrons at production stages (a chemical compound of UF_6) and storages of nuclear fuel (finished goods – UO_2, regenerate, (Pu, Th) O_2, (U, Pu) O_2, UC / (U, Pu) C, UN / (U, Pu) N)).

In the work the physical and mathematical model of processes allowing to carry out quantitative estimates of an exit of neutrons from various fuel compositions is offered. Calculation of spectral structure of radiation is performed by sharing of a settlement code on the basis of the Monte-Carlo method (MCU_5) and modern libraries of the estimated nuclear data.

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WWER-1300 SAFETY SYSTEMS ANALYSIS

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This paper discusses the principles of WWER-1300(WWWER-TOI) safety. WWER-TOI or WWER-TOI is a project for a two-unit water pressurized reactor constructed to meet modern nuclear and radiation safety requirements.

The paper considers:

Safety barriers

WWER-TOI project shows the implementation of the following principles ensuring the modern concept of the repetitive defense in depth: to create a number of consequential barriers preventing the emission of radioactive products to the environment, which are accumulated during the operation. Fuel matrix, fuel cladding, reactor vessel and pile envelope serve as barriers for WWER. [1]

Protection of the NPP from external influences

The most significant influences, which parameters significantly affected the technical solutions of the WWER-TOI project are: seismic influences (SSE to 8 points and LE to 7 points); influences bound to a plane crash; influence of the external air shockwave with compression pressure in the front of 30 kPa; floods and storm; hurricanes and tornadoes (rated maximal speed of wind is up to 56 m/s).

Severe Accident Management

Modern nuclear power plant has an unprecedented low risk of the spread of ionizing radiation and radioactive substances in the environment. This is achieved by the newest protecting and localizing safety technologies. In the project "WWER-TOI", a combination of active and passive safety systems has been adopted. Molten core catcher is a means of non-project accident control in the "WWER-TOI" design.

A combination of passive and active safety systems, envisaged in the project "WWER-TOI," ensures the absence of destruction of the reactor core within 72 hours from the beginning of non-project accident occurrence. In case of the loss of all power sources, the technical solutions of the project ensure the transition of reactor plant equipment into the safe state under any initial conditions (natural and technogenic). This feature increases the competitiveness of the project on the external and internal markets of electricity generation. [2]

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RESEARCH OF BETA – RAY ATTENUATION COEFFICIENT FOR ALUMINIUM

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It is well-known that one type of radioactivity is β-decay, wherein the charge of atomic nucleus is changed by one unit, but its mass remains the same. The characteristic feature of this phenomenon consists in continuity of energy spectrum of emitted particles (electrons or positrons), while spectra of α- and γ-radiation are discrete. That kind of difference is caused by the appearance of two light particles during β-decay. There is an electron and electron antineutrino, or a positron and electron neutrino. Therefore, the decay energy is divided between those two particles.

The continuity of energy spectrum of emitted β-particles results in specific problems of β-spectrometry, which are related to the identification of radiating nuclide (or group of nuclides) in an investigated sample, as well as to the determination of corresponding activities.

Also, continuous energy distribution of β-particles accounts for their complex interaction with the matter: attenuation of particle flux by absorbent material is the superposition of all attenuations of monoenergetic electrons in radiation spectrum.